

Claims

1. Method for controlling a spraying apparatus, especially a spraying apparatus designed for the humidification of intake air, said apparatus comprising at least two spraying nozzles (1a, 1b, 1c, 1d) for spraying a liquid into the intake air, characterized in that, in accordance with the control system's instructions, when the required amount of liquid to be supplied through the nozzles increases, liquid flow passages are opened for more nozzles (1a, 1b, 1c, 1d) and/or the liquid flow is directed into a flow passage leading to a nozzle that permits a larger liquid flow through it per unit of time, and when the required amount of liquid to be supplied through the nozzles decreases, liquid flow channels are closed at least for some of the nozzles (1a, 1b, 1c, 1d) and/or the liquid flow is directed to a nozzle that permits a smaller liquid flow through it per unit of time.
2. Method according to claim 1, characterized in that a substantially constant amount of liquid per unit of time is fed into a supply pipe (4) and at least a portion of the liquid quantity supplied that is not directed to the nozzles is conveyed into a return pipe (5).
3. Method according to claim 1 or 2, characterized in that a constant pressure is maintained in the supply pipe (4), regardless of the number of nozzles injecting.
4. Method according to any one of claims 1 - 3, characterized in that the k-value (resistance) of at least one of the channels leading into the return pipe (5) is adjusted to make it correspond to the k-value (resistance) of the nozzles in closed state.
5. Method according to any one of claims 1 - 4, characterized in that the value of the sum of the activated (open) k-values is kept substantially constant.
6. Method according to any one of claims 1 - 5, characterized in that the liquid to be fed into the return line is conveyed through at least one return channel (3a, 3b, 3c, 3d) into the return pipe.

7. Method according to any one of claims 1 – 6, characterized in that the return channel (3a, 3b, 3c, 3d) is provided with at least one valve element (A2, B2, C2, D2), which is controlled on the basis of impulses given by the control system.

8. Method according to any one of claims 1 – 7, characterized in that, in at least one return channel (3a, 3b, 3c, 3d), a throttle element (17a, 17b, 17c, 17d) or equivalent having a k-value adapted to correspond to the k-value of the at least one closed nozzles is used.

9. Method according to any one of claims 1 – 8, characterized in that the amount of liquid to be supplied through the nozzles (1a, 1b, 1c, 1d) is adjusted as a function of the engine load.

10. Method according to any one of claims 1 – 10, characterized in that a liquid mist, especially a water mist is injected through the nozzles (1a, 1b, 1c, 1d).

11. Method according to any one of claims 1 – 10, characterized in that the liquid mist is injected at a pressure of 10 – 300 bar.

12. Method according to any one of claims 1 – 11, characterized in that the maximum droplet size of the liquid mist injected is typically 200 micrometers.

13. Method according to any one of claims 1 – 12, characterized in that a second medium is conveyed to the nozzle when in it is in closed state to prevent clogging of the nozzle.

14. Apparatus for supplying a liquid mist into the intake air of an engine, said apparatus comprising at least two nozzles for spraying a liquid mist liquid into the air intake duct, characterized in that the apparatus comprises at least two feed channels (2a, 2b, 2c, 2d) with valve elements (A1, B1, C1, D1) arranged in them, a control system giving impulses on the basis of which the aforesaid valve elements are opened

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and closed, and liquid supply means (4, 6, 10) for supplying an aqueous liquid into a feed channel (2a, 2b, 2c, 2d) leading to at least one nozzle.

15 15. Apparatus according to claim 14, characterized in that the apparatus further comprises an outlet pipe (5) and at least one outlet channel (3a, 3b, 3c, 3d), through which a connection to the outlet pipe from the supply pipe (4) leading to the nozzles can be opened and closed.

10 16. Apparatus according to claim 14 or 15, characterized in that the outlet channel (3a, 3b, 3c, 3d) is provided with a valve element (A2, B2, C2, D2) arranged to close when the corresponding valve element (A1, B1, C1, D1) in the feed channel (2a, 2b, 2c, 2d) leading to the nozzle opens and to open when the valve element in the corresponding feed channel leading to the nozzle closes.

17. Apparatus according to any one of claims 14 – 6, characterized in that the apparatus comprises means for keeping the flow resistance (sum of k-values) constant.

20 18. Apparatus according to any one of claims 14 – 17, characterized in that the apparatus comprises a number of feed channels (2a, 2b, 2c, 2d) leading to the nozzles and a corresponding number of return channels (3a, 3b, 3c, 3d) as well as valve elements for each feed channel and return channel, each feed channel – return channel pair being controlled together so that when the feed channel opens, the return channel closes and vice versa.

30 19. Apparatus according to any one of claims 14 – 18, characterized in that the return channels are provided with a throttle element (3a', 3b', 3c', 3d') or equivalent.

35 20. Apparatus according to any one of claims 14 – 19, characterized in that the liquid supply means comprise a liquid source (10) and a pump (6).

21. Apparatus according to any one of claims 14 – 20, characterized in that the control system has been adapted to control the apparatus on the basis of engine load.
- 5 22. Apparatus according to any one of claims 14 – 21, characterized in that the apparatus comprises means (33) for regulating the temperature of the first pressure medium.
- 10 23. Apparatus according to any one of claims 14 – 22, characterized in that the apparatus comprises means (20, 21, 25a, 25b, 25c, 25d) for conveying a second pressure medium to a nozzle (1a, 1b, 1c, 1d) whose feed channel is in closed state, to prevent clogging of the nozzle.
- 15 24. Apparatus according to any one of claims 14 – 23, characterized in that it comprises means (34, 36, 14) for filtering at least the first pressure medium.